Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **October/November 2017**

MARK SCHEME

Maximum Mark: 80

Published

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	$\frac{9}{35}$	**1**	
1(b)	200	**1**	
2(a)	7, 8, 5 all three	**1**	
2(b)	18 × their (min. frequency) FT provided min. frequency < 20	**1**	
3	$\frac{1}{2}$ oe nfww	**2**	**B1** for "k" = $\frac{30}{6}$ oe if $y = \frac{k}{x}$ used or FT **M1** for y = (*their k*) / 10 when y = "k" / x used or **M1** for $\frac{1}{6} \times 30 = y \times 10$
4(a)	$\frac{1}{8}$; or 0.125	**1**	
4(b)	$4x$	**1**	
5(a)	68	**1**	
5(b)	14 33; or 2.33 p.m.	**1**	
6(a)	3.84	**1**	
6(b)	4	**1**	
7(a)	78°	**1**	
7(b)	70°	**1**	
8(a)	0	**1**	
8(b)	1.5	**1**	
9(a)	7.5	**1**	
9(b)	3 nfww	**1**	

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Question	Answer	Marks	Partial Marks
10	Two or three of 40, 6, 3000	**M1**	
	Final answer 0.08 cao nfww	**A1**	**C1** for 0.08 without any working.
11	14 years 6 months nfww	**2**	**M1** for (3 × (14 years 3 months) + 15 years 3 months) oe
12(a)	25	**1**	
12(b)	$\frac{1}{5}$; or 0.2	**1**	
13(a)	40	**1**	
13(b)	rectangle: base 40 to 50; frequency density (height) 3	**1**	
	rectangle: base 50 to 80; frequency density (height) 1	**1**	
14	–2 and –1	**3**	**B1** for (–)5x ... (–)k ; or (–)1 ... (–)$\frac{5}{k}x$ (i.e. collecting x terms, where ... represents any inequality symbol, or =) and k = 12, 4, 3, 1 or 48. Or equiv., with zero on one side and both terms on the other. **B1** for $x > -2.4$; or for $-2.4 < x$ If 0 scored, then **C1** for one correct solution or for $x = -\frac{12}{5}$ oe in the answer space.
15(a)	5	**1**	
15(b)	72, 70, 38 all three	**2**	**C1** for 72 and 70; or for three angles totalling 180°.
16(a)	3.6×10^{8}	**1**	
16(b)(i)	4.5×10^{-6}	**1**	
16(b)(ii)	(±) 3×10^{-8}	**1**	
17(a)	77	**1**	
17(b)	20	**2**	**M1** for a wholly correct method, such as $\frac{15000 - 12000}{15000} \times 100$
18(a)	236	**2**	**M1** for 2 × 5 × 11 + 2 × 5 × 6 + 11 × 6 oe or **C1** for 302
18(b)	30	**1**	

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Question	Answer	Marks	Partial Marks
19(a)	Probabilities 0.7 and 0.3 on the correct branches	**1**	
19(b)(i)	0.49 oe	**1**	
19(b)(ii)	0.42 oe	**1**	FT from their diagram, provided their diagram probabilities are less than 1, and 0 < ans. < 1.
20(a)	–2	**1**	
20(b)	$y = -2x + 4$ or FT $y =$ (*their*(a)) $x + 4$ or $y =$ (*their*(a)) $(x + 3) + 10$	**1**	
20(c)	(3, –2)	**2**	**C1** for one correct coordinate
21(a)	$\begin{pmatrix} 7 & 9 \\ -15 & -16 \end{pmatrix}$	**2**	**C1** for two or three correct elements, or for 3 or 4 elements of $\begin{pmatrix} 11 & -3 \\ -15 & -8 \end{pmatrix}$.
21(b)	$-\frac{1}{7}\begin{pmatrix} -4 & -1 \\ 5 & 3 \end{pmatrix}$ oe, e.g. $\begin{pmatrix} \frac{4}{7} & \frac{1}{7} \\ -\frac{5}{7} & -\frac{3}{7} \end{pmatrix}$	**2**	**B1** for (det **A** =) –7 or **B1** for $\begin{pmatrix} -4 & -1 \\ 5 & 3 \end{pmatrix}$ seen
22(a)	$3a(3a - 2)$	**1**	
22(b)	$(2 - 5t)(2 + 5t)$	**1**	
22(c)	$(x + 3d)(2c - y)$	**2**	**B1** for one of the partial factorisations: $x(2c - y)$, $3d(2c - y)$, $2c(x + 3d)$, $-y(x + 3d)$, $y(x + 3d)$
23(a)	97 to 99 inclusive	**1**	
23(b)	Acceptable line	**1**	
23(c)	Full circle, centre *C*, radius 5 cm	**1**	
23(d)	4.3 to 4.9 cm, dep. on two labelled intersections of an acceptable line and arc.	**1**	
24(a)	21	**1**	
24(b)	$\frac{18}{20}$ oe	**1**	
24(c)	420	**2**	**M1** for a correct, complete, method to find the area. e.g. $\frac{1}{2} \times (30 + 12) \times (60 - 40)$; $12 \times (60 - 40) + \frac{1}{2} \times (60 - 40) \times (30 - 12)$; $(60 - 40) \times 30 - \frac{1}{2} \times (60 - 40) \times (30 - 12)$

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Question	Answer	Marks	Partial Marks
25(a)	$7x + 5y > 35$ oe **and** $x < 4$ oe **and** $y < 5$ oe	**2**	**C1** for two inequalities correct; or for x ... 4 and y ... 5 (with "..." $\neq$ " < ").
25(b)	3 nfww	**2**	**B1** for x-coord. of A is $\frac{10}{7}$ oe; or for eqn. of OA is $y = \frac{7}{2}x$ oe
26(a)	49, 19, 30	**1**	
26(b)(i)	$3n + 4$ oe and isw	**1**	
26(b)(ii)	$(n + 2)^2$ oe	**1**	
26(c)	$n^2 + n$; or $n(n + 1)$	**2**	**M1** for attempt at *their*(bii) – *their*(bi), provided both parts are different expressions in n, and the answer space also contains an expression in n, or is empty: or for a valid method.
27(a)	7	**3**	**M1** for $\left\lvert\overrightarrow{OP}\right\rvert = \sqrt{(-3)^2 + (4)^2}$ **B1** for $\left\lvert\overrightarrow{PQ}\right\rvert = 2$
27(b)(i)	$\begin{pmatrix} -3 + 2k \\ 4 \end{pmatrix}$ oe	**1**	
27(b)(ii)	$4\frac{1}{2}$ oe	**2**	**B1** for expressing $\overrightarrow{OM}$ as a multiple (by 4) of $\overrightarrow{OT}$ or **B1** for T is (6, 4); or for $\overrightarrow{OT} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$

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